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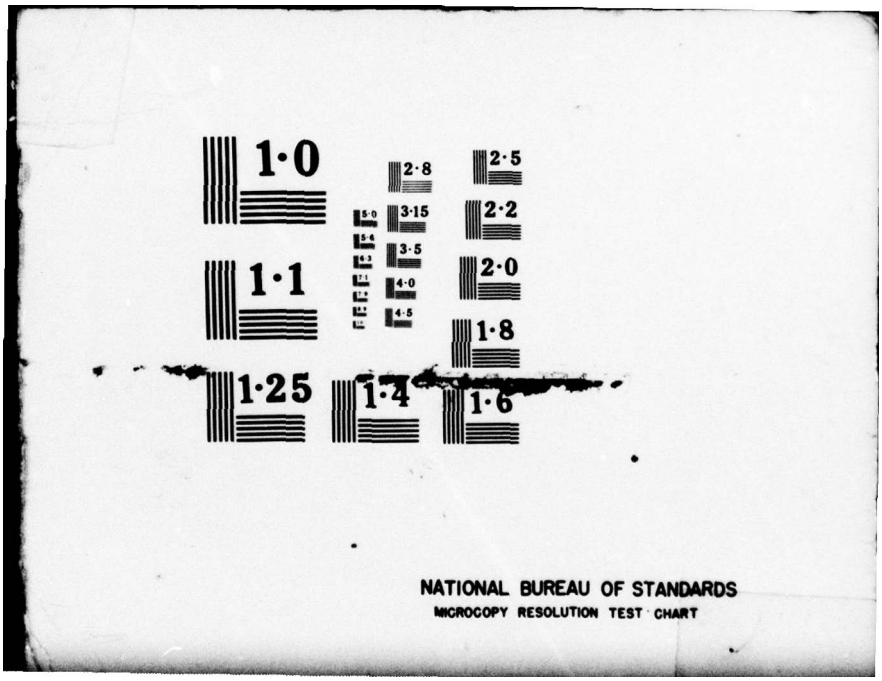
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AIRPORT GROUND ACCESS STUDY

Mark Gorstein
Richard Marek

U.S. DEPARTMENT OF TRANSPORTATION
RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION
Transportation Systems Center
Cambridge MA 02142

MARCH 1978

INTERIM REPORT

Prepared for

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16. Abstract

In response to a request by Congress, the FAA and TSC have undertaken a study to determine the extent to which inadequate (off-airport) ground access to airports constrains airport capacity and air travel. Presently, TSC is preparing case studies of 17 commercial airports of various sizes and locales. This report describes the initial phases of a study on airport access which includes:

- (1) A methodology for evaluating airport ground access capacity. Data availability and requirements for the application of capacity analysis to any airport access system have been established,
- (2) A look at the airport access problem as perceived by the operators of large, medium, and small hub airports, as well as a non-hub airport. Information on access conditions was collected and categorized,
- (3) A review and summarization of a number of previous access studies, and
- (4) A review and description of the planning, funding, and implementation process for airport access.

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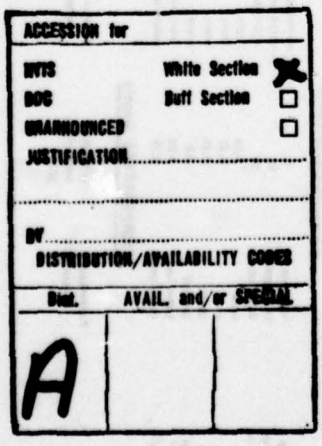
PREFACE

Landside access, in the opinion of a number of airport authorities, is potentially a major limitation to future airport growth. At the same time, airport access is subject to competing transportation priorities as well as conflicting interests and pressures of various organizations and concerned citizens.

The Transportation Systems Center, under the sponsorship of the Office of the Secretary of Transportation, and the Federal Aviation Administration (FAA) has, for the past few years, been investigating problems of airport access. Its present efforts funded by the FAA under Project Plan Agreement FA-860, cover the development of quantifying airport access capacity. Under the same program, the Center has also considered airport access planning in the context of overall, urban and regional transportation planning to determine whether access needs were receiving adequate attention.

This report responds to a Request from the United States Senate Committe of appropriation to the FAA.



METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
	AREA			
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
	MASS (weight)			
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
	VOLUME			
tsp	teaspoons	5	milliliters	ml
tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
	TEMPERATURE (exact)			
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
	AREA			
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
	MASS (weight)			
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
	VOLUME			
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
	TEMPERATURE (exact)			
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F

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EXECUTIVE SUMMARY

Airport access has been identified as a potential limitation to the growth of aviation. The Senate Committee on Appropriations in their Report No. 95-268, dated June 14, 1977, directed the "...FAA to undertake a comprehensive study on the constraints imposed on air travel and airport capacity by inadequate ground access. The FAA should consider the appropriate roles of FHWA and UMTA in the eventual alleviation of this problem. Specific airports should be identified that are adversely impacted by poor ground access and recommendations proposed for funding under Section 23 of the Airport and Airway Development Act of 1976. The Committee expects the results of this study by April 1, 1978." This report responds to that mandate.

The main objectives of this study are fourfold as follows:

1) To identify and project the access capacity of representative airports;

2) To determine if access needs at these airports are adequately considered within the planning process;

3) To identify potential solutions to noted access problems; and

4) To identify projects for consideration by local public bodies and planning authorities which could improve airport access in selected cases.

This report describes the initial phases of a study on airport access which includes:

- A methodology for evaluating airport ground access capacity. A detailed study can quantify the number of hours during which airport capacity and demand exceed ground access capacity. Data availability and requirements for the application of capacity analysis to any airport access system have been established.

- A look at the airport access problem as perceived by the operators of large, medium, and small hub airports, as well as a non-hub airport. Information on access conditions was collected and categorized. Interestingly, over one-third of the airport officials contacted believe that their airport currently has an access problem. Of those, almost all cite congestion on the access roadway system as the cause of the problem.
- A review and summarization of a number of previous access studies.
- A review and description of the planning, funding and implementation process for airport access. Under current U.S. Department of Transportation (DOT) legislative authority, the Federal Aviation Administration (FAA) may, subject to certain statutory limitations, issue grants under the Airport Development Aid Program (ADAP) for improved ground access within the boundaries of the airport while off-airport ground access projects may be funded only through the Federal Highway Administration (FHWA) and the Urban Mass Transportation Administration (UMTA).

The major findings of this report are:

- There has been no comprehensive prior assessment of the extent to which inadequate ground access limits or constrains air travel nationwide.
- The national and regional planning process and organizations are adequate for the consideration of airport ground access.
- Previous nationwide studies of airport ground access have failed to assess the economic impact of inadequate ground access.
- Data needed for airport access planning should be collected more frequently and coordinated with the data acquisition and analysis systems of metropolitan transportation planning agencies.

This study was initiated at the start of this fiscal year (FY-1978). The complexity of the problem requires that additional work be accomplished. The remaining effort will be necessary to portray an overall national picture of the airport access problem and attempt to offer possible solutions. The follow-on work will be presented in the form of an addendum to this report which will be submitted on or before September 30, 1978. The addendum will include:

- o Demand/Capacity Case Studies - A number of airports will be the subject of case studies on airport ground access. Access capacity, airport capacity and demand will be estimated and compared to acceptable norms.
- o Potential Access Improvement Projects - Common problems and solutions will be selected from case studies for consideration by local and state transportation planning bodies.
- o Federal Highway Administration (FHWA) and Urban Mass Transportation Administration (UMTA) Studies - The FHWA's Central Business District (CBD)/Airport driving time studies of 1968 and 1972 will be updated. Information on major FHWA and UMTA projects that have or will improve airport access will be considered.

1. INTRODUCTION

1.1 THE EXTENT AND NATURE OF THE AIRPORT GROUND ACCESS PROBLEM

The Senate Committee on Appropriations in their Report No. 95-268, dated June 14, 1977, directed the "...FAA to undertake a comprehensive study on the constraints imposed on air travel and airport capacity by inadequate ground access. FAA should consider the appropriate roles of FHWA and UMTA in the eventual alleviation of this problem. Specific airports should be identified that are adversely impacted by poor ground access and recommendations proposed for funding under Section 23 of the Airport and Airway Development Act of 1976. The Committee expects the results of this study by April 1, 1978." This report responds to that request.

Airport access is defined as the process by which people and goods travel from their local origins to nearby airports. The people include air passengers, airport and airline employees, persons accompanying the air passenger to the airport, and casual visitors. The goods include freight, mail, fuel, and items used at the airport. The most critical of the access trips to the airport are generally conceded to be those of the air passenger, and it is air passenger access upon which this study is focused.[1/]

A number of major airport authorities have identified inadequate access to their airports, beyond the airport boundaries, as a problem which could limit the growth potential of their facilities. In general, airport authorities lack direct responsibility for planning, building, and operating highway and transit systems beyond the airport boundaries. Service in these areas is the responsibility of authorities for whom the airport is generally only one of a number of major traffic generators. These circumstances and lack of responsibility can raise the question of whether present and future airport needs are being sufficiently considered in most planning environments.

1/Airport access by others will also be considered, but only to the extent that it affects airport access of air passengers.

The crux of this problem is whether existing and planned access facilities and systems are adequate. This question is difficult to answer because adequacy is defined differently by various airport users. Those who feel that airport access is inadequate include not only the frequent passenger who may lament that the trip to and from the airport takes longer than the flight, but also a percentage of professional airport planners.

On the other side of the debate are equally knowledgeable people who feel that the air passenger is not necessarily entitled to "Cadillac Service." They note that most access systems can be improved but that their improvement may not be the appropriate use of scarce resources.

This difference in perspective implies only that priorities as well as standards for defining adequacy differ among individuals and situations. It does not imply that adequacy is immeasurable. Indeed, numerous studies have sought to quantify the adequacy of access to individual airports and to compare airports as to the adequacy of their access systems.

Among the measures that have been used to quantify the quality of airport access are the following:

- Average point-to-point travel time,
- Average variance in travel time,
- Average congestion delay (difference between peak and off-peak travel),
- Level of service of the access trip,
- Capacity of the access system.

The usefulness of any of these measures depends upon the context in which it is applied. Capacity of this access system and average point-to-point travel time will be the measures used in this study for reasons explained in subsequent paragraphs. Nethertheless, it is useful to summarize the other measures.

Average point-to-point travel time is an excellent measure for comparing the quality of access among airports or for comparing the quality of access before and after an improvement in the

access system. It can be translated into economic benefits and is useful in estimating changes in airport activity.

Average variance in travel time is another measure of the reliability of the access system. Since it is correlated with the amount of time a passenger must allow between his arrival at the airport and his flight departure, its benefits as a measure of the quality of airport access are similar to those of average travel time. However variance in travel time is both harder to measure and harder to predict.

Average congestion delay (difference between peak and off-peak travel time) is a third measure of the extent to which an airport's ground access system might be improved. It also can be translated into ecomonic terms.

Level of service in the access trip is a fourth and abstract measure encompassing speed, time, safety, cost, and mental and physical stress upon the user. As such, its definition is as ambiguous as that of adequacy. Nevertheless, many researchers have attempted to measure or compute it in a fashion which correlates with the user's propensity to travel. More commonly, however, the standard definition provided in the Highway Capacity Manual is used which relates the level of service of the access system in terms of speed and volume to capacity.

Capacity, the yardstick used in this study, is the physical ability of a system to handle a given volume of traffic. Capacity is quite often used in airport master planning studies to assess the adequacy of the access system in the immediate vicinity of the airport. Capacity, in practical terms, is the principal consideration that determines a given level of service.

Capacity is an elusive concept, even in the case of a single road leading to the airport. If all passengers could be persuaded to come by bus, for example, many more passengers could be handled than if all passengers came by car. Furthermore, if passengers traveled to the airport before the peak period and waited for their flight rather than traveling at the most desirable hour, many more

airport-bound passengers could be handled on the access system. As one moves away from the airport boundary, any meaningful concept of airport access capacity becomes less and less absolute. As one segment of roadway approaches its capacity, airport travelers and others may switch to alternative, less convenient road segments or to alternative modes of transport.

There are three advantages to the capacity measure that are responsible for its widespread use. The first and most important one for airport planners, is that it presents an "absolute" criterion for assessing whether a given demand can be handled; thus it provides a strong argument for action whenever forecast demand exceeds capacity. Second, the impacts of inadequate capacity can be quantified economically through the estimation of delay, and estimation of trips cancelled. Third, airport planners are used to thinking in terms of capacity because that is the way in which the adequacy of on-airport facilities have traditionally been measured. Indeed, even the Congressional language directing the FAA to undertake this study reflects this viewpoint:

> "...a comprehensive study on the constraints imposed on air travel and airport capacity by inadequate ground access...."

These advantages motivate the use of capacity in this study as a primary measure of the adequacy of airport ground access. However, the elusiveness of the concept must first be overcome. Consequently, access capacity and airport capacity are defined as volumes of airport passenger originations that can be handled by the access and airport systems, respectively, without significantly affecting the unconstrained behavior of air passengers, air carriers, and other users of the highway and transit systems. Where demand and airport capacity exceed access capacity, the inadequacy of the access system is defined and measured by the number of hours in which this situation exists, and by the number of passengers affected. The assumption of unconstrained user behavior in the definition of capacity recognizes that deviation from this behavior--for example, the use of less than preferred routes or modes--is a burden to the user and therefore has economic

consequences. It does not imply, however, that these burdens should or must be removed.

From the Federal perspective, the capacity measure is an appropriate one. Through the Airport Development Aid Program, the Government spends millions of dollars every year to help expand the capacity of airports to meet forecasted growth. Nevertheless, a 1974 FAA study[1/] indicated that the existing access system to some airports may be saturated before this capacity is reached. In short, attention to the airport system has exceeded attention to the access system with the result that some airport capacity may remain unutilized.

In this context, the objectives of this study are fourfold, as follows:

1) To identify and project the access capacity of representative airports;
2) To determine if access needs at these airports are adequately considered within the planning process;
3) To identify potential solutions to noted access problems; and
4) To identify projects for consideration by local public bodies and planning authorities which could improve airport access in selected cases.

The study methodology is as follows: First, the FAA and a large number of airports are contacted to determine their perception of the adequacy of access to their airport. Case study airports are then selected covering, to the degree possible, the types of airports with perceived access problems. Access capacity and airport capacity are computed as defined above and then compared in order to determine the adequacy of the access system. The economic implications of inadequate access is then explored. Solutions to access problems are reviewed in general and for the case study airports, and suggestions are offered as to how airport access conditions might be improved in certain cases. Current

1/ MITRE Corporation FAA Report on Airport Capacity, FAA-EM-74-5-I (NTIS: Springfield VA), May 1974.

practices of planning for airport access will be reviewed and critiqued in the addendum to the study.

1.2 DIMENSION OF THE PROBLEM AS VIEWED BY THE AIRPORT OPERATOR

In order to get a feel for the nature of the airport access problem, and for how it is perceived, officials of a large number of airports were contacted by phone. Officials were contacted at all large hubs, at one-half of all medium hubs, at one-quarter of all small hubs, and at one non-hub. At the small hubs, contact was made generally with the airport manager; at medium and large hubs, however, members of the technical staff were generally contacted, and no attempt was made to ascertain whether or not the views of those contacted adequately represent the views of those in a decision-making capacity.

Over one-third of the airport officials contacted believe that their airport currently has an access problem. Surprisingly, the percent of airports perceiving a problem is nearly independent of the hub size. Specifically, as shown in Table 1, 31 percent of the large hubs, 37 percent of the medium hubs, and 36 percent of the small hubs currently experience an access problem. In most cases, these problems are expected to persist. At only five of the 23 airports is an access problem expected to be resolved. There is also an expectation of future problems at three airports that currently have satisfactory access.

Of those airports for which access is a problem, almost all spokesmen cite congestion on the access roadway system as the cause of the problem. Of these, more than half claim that the congestion exists along major lengths of the road and is not limited to one or more bottlenecks such as interchanges, intersections, tunnels, or railroads. Table 1 presents the location of the congestion problem by size of hub. Once again, no trend is apparent by size of hub.

An attempt was made to determine the extent to which the airport traffic itself contributed to the congestion problem. In Table 1, it is noted where the major congestion was due to extraordinary or noncontinuous events, such as a sports competition

TABLE 1. THE EXTENT AND NATURE OF THE AIRPORT ACCESS PROBLEM AS PERCEIVED BY AIRPORT OFFICIALS

CATEGORIZATION[2]	NUMBER OF AIRPORTS[1] LARGE HUBS	MEDIUM HUBS	SMALL HUBS	ALL HUBS
1. Is there a problem now or in the future?				
A. Now and future: yes	7	4	7	18
B. Now, yes; future, no	1	3	1	5
C. Now, no; future, yes	1	2	0	3
D. Now and future: no	17	10	14	41
2. Where is location of congestion?				
A. General; no bottleneck	3	8	4	15
B. Interchange	2	1	0	3
C. Intersection	2	0	3	5
D. Tunnel	2	0	0	2
E. Railroad Crossing	0	0	2	2
F. Other or None	1	0	0	0
3. What traffic causes congestion?				
A. Airport related	6	3	0	9
B. Special events	1	1	2	4
C. General urban traffic	3	5	6	14
D. No congestion	1	0	0	1
4. What is the "missing" ingredient"?				
A. Money	3	1	7	11
B. Land	3	2	0	5
C. Community support	2	0	1	3
D. Jurisdiction	1	0	2	3
E. Other	1	6	0	7

[1] In categorizations 2, 3, and 4, some airports are placed into more than one category

[2] Categorizations 2, 3, and 4 apply only to airports categorized as A, B, or C in Question 1.

(raceway, golf tournament, etc.), or the beginning and ending of the workshift of a particularly large and nearby industrial firm. In most cases, however, congestion is due to general urban traffic not necessarily traveling to or from the airport. This trend, however, is more apparent in the smaller the hub. The larger hub airports can, and quite often do, create their own congestion.

Finally, an attempt was made to ascertain the primary missing ingredient to the solution of the access problem. The predominant answers to these questions are land, money, community support, and the appropriate jurisdiction. In some cases, however, there is no missing ingredient -- plans to improve access may have already been formulated and await implementation, the problem may not be severe enough to warrant action, or the problem may be so complex as to preclude the identification of any one missing ingredient.

1.3 REVIEW OF PREVIOUS ACCESS STUDIES

This section describes past studies that address the problems of airport access on a nationwide basis. It does not review technical papers and reports that have been written on specific airports.

1. DOT-TSC-OST-73-32, I: Airport Access/Egress Systems Study, prepared for Office of R&D Policy, Wilbur Smith & Associates, September 1973.

In this study, 34 of the United States' airports projected to be serving more than 2.0 million annual enplaned passengers each by 1980, were studied to ascertain the types and status of their access/egress problems. The study included both on-, and off-airport systems.

Data collection techniques included literature review, personal interviews with appropriate representatives at each of the airports and a survey questionnaire sent to each airport which was administered and analyzed. Supplementing these data sources were interviews with airline personnel, airport industry representatives and federal officials.

Ground access sufficiency (demand/capacity) was measured by a formula relating traffic demand to enplaned passengers, transfers and employees. Capacity was measured by examination of highway access at airport access roads. No specific account of non-airport traffic and public transportation modes were made.

The report concluded that:

- o Origins of air travelers presently oriented to the airports are too dispersed to economically justify rapid transit corridor investments;
- o Limited availability or use of primary or secondary access/egress routes to most airports places substantial demand upon a single road system;
- o Too much off-street parking is being provided in the central terminal area in relation to the capacity of the road system to serve same; and
- o Too much vehicular activity is concentrated at or near the enplaning and deplaning curbs in the terminal areas.

Three specific operational experiments were recommended:

a. A remote parking experiment at Detroit Metropolitan Airport, Detroit Michigan;

b. A rail-bus connection at JFK International Airport, New York New York; and

c. A parking lot baggage check-in system at Sea-Tac Inter-National Airport, Seattle Washington.

2. FHWA: Airport Access Study, Comsis Corporation, July 1972.

This study was initiated by the FHWA's Urban Planning Division to develop a method for assessing the impact of airport-oriented vehicular trips on highway facilities. This was accomplished using existing urban transportation study data files and computer programs available from the Federal Highway Administration. Four urbanized areas were selected: Birmingham, Alabama; Boston, Massachusetts; Louisville, Kentucky; and

Minneapolis-St. Paul, Minnesota. The data generated were analyzed and summarized by five major categories for presentation:

a. TRIP (data comparing total vehicle trips to airport-oriented vehicle trips).

b. VEHICLE-MILE (vehicle miles of travel to the airport).

c. TRIP LENGTH (a comparison of an areawide vehicle trip length distribution to a trip length distribution for vehicles having an origin at the airport).

d. LINK (links carrying one percent or more vehicles having an origin at the airport were posted on a highway network map).

e. GEOGRAPHIC ORIENTATION (illustrations showing the dispersion of airport trips to and from the airport).

The study concluded that data files and computer programs common to every urban transportation study can be used to generate information to measure the impact of airport-oriented vehicular travel on highway facilities. Results showed that airport-oriented travel accounts for only 0.55 percent of total vehicle trips and 0.80 percent of total vehicle-miles of travel (average of four study areas).

The study was limited in that it did not consider public transportation, did not consider peaking characteristics, and used old data (1958-1965). In general, data generated for transportation studies (normally obtained from home-interviews) can be grossly in error when representing airport trips.

3. DOT-TST-75-12: The Airport/Urban Interface, DOT Systems Division and Technology, Robert L. Paullin, July, 1974.

Ground access was analyzed by an ad hoc Working Group, with the objective of recommending appropriate Departmental actions to improve ground transportation to airports where deemed necessary. The group reviewed prior studies, current Departmental authority and responsibilities, and ongoing planning and capital funding programs. The report used prior studies as technical input; no

new technical work was performed, but, institutional constraints were addressed.

Major findings were:

- o Lack of adequate data, lack of a validated analysis methodology, and lack of performance criteria have hindered objective studies of airport access.
- o Congestion occurs most frequently on highways adjacent to and inside the airport boundary; private autos account for 70 percent of all trips, rubber-tired vehicles 95 percent.
- o Effort to improve the capacity of existing airports and the development of new airports should be undertaken with the idea of achieving a balance between airside and landside capacity.
- o Modal planning and capital grant programs should address the airport/urban interface on an intermodal basis.
- o No new statutory authorization appears necessary, at this time (1974), to develop and implement solutions to congestion problems.

4. FAA-EM-74-5-I: FAA Report on Airport Capacity, MITRE Corporation, May 1974.

This study related to all capacity problems and had little to say about access per se. Access problems were identified based on discussions with airport sponsors. The problem was not analyzed further.

5. FAA-RD-75-12: Forecast of Landside Airport Access Traffic at 211 Major U.S. Airports to 1990, Verve Research Corporation, February, 1976.

Regression models were run to forecast 1990 traffic. SMSA populations, passenger enplanements, percent transfers, highway lanes and existence of a rail line were used as input. The results suffered from a scarcity of data.

6. DOT-TSC-FA-632-WP-76-4: Airport Access Case Studies, Boston - Los Angeles - Philadelphia; Mark Gorstein, February 1977*

This report exmphasizes an analysis of the place of airport access in the metropolitan transportation planning process. The analysis was based on discussions with officials and on prior reports; no new data collection was undertaken. The report reached the following conclusions:

- o The existing airport planning process can arrive at compromises to conflicting interests if the differences are not too great; however, the process cannot work unless planning is desired at the regional/local level. It is participatory, not mandatory.
- o Airport access planning is usually secondary to, or highly contingent on, solutions to other, larger transportation problems.
- o Airport access improvements face increasing competition from other public and community requirements.
- o Forecasts on which to base access planning are especially difficult to make because they involve both vehicular traffic predictions and air travel predictions.

7. DOT-TSC-OST-72-17: A Survey of Airport Access Analysis Techniques - Models, Data, and a Research Program, L. Brown, et al. June 1972.

This study reviewed current techniques for analyzing airport access. It concluded that:

- o Solutions to the airport access problem should be developed within the framework of the general urban transportation problem.
- o The airport access problem deserves special consideration not only because of its relative importance to the urban economy, but also because of the travel features that distinguish it from other urban trips.

* On file at TSC.

- o The uniqueness of these features pose special problems in the areas of analysis, design, and operation.

8. FHWA: Travel Time from the Central Business District (CBD) to the Airport in 55 Medium and Large Hubs, 1968 and 1972.

A survey of peak and off peak travel times between the Central Business District (CBD) and 55 medium and large hub airports. The studies originally conducted in 1968 and 1972 will be repeated in 1978.

9. Airport Systems Planning: A Critical Look at Methods and Experience (MIT Press: Cambridge, Mass.), 1976, Chapter 5: "Getting There and Back", Richard deNeufville.

This study reviews the nature of access travel and the more commonly proposed solutions. It concludes that, although it is difficult in the abstract to establish in advance what the details of an access program for any specific airport should be, experience suggests that the best overall policy is to rely on automobile transport, private or collective, as the least expensive means to provide access to the airport for most people.

2. PLANNING FOR AIRPORT ACCESS: A REVIEW OF CURRENT PRACTICES

2.1 PROCESS AND STRUCTURE

Responsibility for encouraging the participation in urban and regional transportation planning is carried by the Department of Transportation and implemented through the modal administrations, including the Federal Aviation Administration (FAA), the Federal Highway Administration (FHWA), and the Urban Mass Transportation Administration (UMTA). Federal modal legislation mandates a continuing, comprehensive, and cooperative planning process (called the 3C Process) within each urbanized area over 50,000 population.

There is no single planning program within the U.S. Department of Transportation which deals exclusively with airport access (i.e., ground transportation to airports) per se. Each modal administration has a program which assists in the development of transportation plans and programs. All planning studies are included in the unified planning work program for each area which is jointly reviewed and approved by the modal administrations. (Airport access planning, a matter which is functionally of interest to all three administrations, must be included in the unified planning work program to be eligible for funding assistance.)

The Federal Highway Administration administers the Federal-Aid Highway Program through the states and metropolitan areas. As part of that program, states are required to commit 1.5 percent of apportioned funds to highway planning and research, with an additional 0.5 percent going to designated metropolitan planning organizations (over 50,000 population) for carrying out the 3C Urban Transportation Planning Process. Project planning, for the Interstate Highway System, and the roads and streets of the primary, secondary and urban systems, is usually done with construction funds as preliminary engineering. Airport access roads are specifically included in the Federal-aid system and therefore are eligible for planning and construction funds. In fact, legislation and administrative directives for the Interstate system clearly indicate terminals such as airports as priority consideration in

locating routes. There are many examples of interstate airport connectors and access improvements from the interstate system.

UMTA's assistance for airport access planning is contained within the Technical Studies Program (Section 9 grants). In addition the R&D program has sponsored seven projects related to airport access, including two on airport-access service, three on new technology, and two on bus service from low-income areas for employment purposes. The Technical Studies Program is widely used to assist transit planning. Typical activities are short-range transit studies, system planning studies, rapid transit engineering studies, and special studies.

The FAA administers a Planning Grant Program which makes awards for airport master and system planning. Airport access studies are an eligible item under master planning, but are limited in scope to studies of a general nature to determine existing and potential access problems.

FHWA, UMTA, and FAA joined together in the Intermodal Planning Group (IPG) for coordination of Federally assisted planning in urbanized areas. The agencies fund transportation planning programs through a Unified Work Program (UWP) developed by the metropolitan Planning Organization (MPO). The MPO is a policy body consisting of locally elected officials. The MPO is designated by the governor to review, for priority assignment, all transportation planning proposals in the region that required funding.

The Federal framework for transportation planning and project development includes several mechanisms by which airport access proposals can be forwarded, developed, and coordinated among Federal modal agencies, and among state, regional and local planning bodies. These include the following:

o The A-95 Review

The Office of Management and Budget requires the A-95 review to help coordinate Federally funded projects. Area-wide clearinghouses, such as the MPO's or regional planning agencies, act as

overview organizations, reviewing and commenting on requests for Federal aid for both planning and construction projects.

- o The Unified Work Program (UWP)

The UWP annually describes all urban transportation related planning activities anticipated within the metropolitan area for the next 1 to 2 years. It lists all transportation-planning activities, including airport access, whether funded by the locality, the state, or the Federal Government. Transportation planning studies not included in the UWP are ineligible for Federal funding.

- o The Intermodal Planning Group (IPG) Review

The UWP is reviewed annually at the Federal level by the IPG to insure coordination of intermodal issues.

- o Transportation Improvement Program (TIP)

This is a program of projects proposed for funding and drawn from the area's transportation plan. The TIP includes an annual element as well as a 3-5 year list of proposed projects. The program of projects must be endorsed annually by the MPO.

2.2 DATA

A review of recent airport access planning documents reveals that the following data are collected for and applied to most analyses of airport access:

- o Inventory of the access system,
- o Passenger and employee mode split,
- o local passenger and employee origin/destination,
- o Traffic counts at roads in the immediate vicinity on the airport.

In many cases, these data are projected into the future. Some of the more sophisticated models[1/] that have been used to study

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1/ Brown, L. et al., A Survey of Airport Access Analysis Techniques--Models, Data and a Research Program, Report No. DOT-TSC-OST-72-17 (NTIS: Springfield VA), June 1972.

airport access require a great deal more data. Following are examples of the types of data that may be required:

- o Physical characteristics (i.e., design volume and length of road links) of the road system in the entire urban area;
- o Urban area trip origin/destination statistics;
- o Headway, travel time, and cost for non-auto modes;
- o Passenger demographic characteristics by local origin/destination zone;
- o Peaking characteristics of urban and airport-related travel.

Passenger and employee mode-split, local origin-destination, and peaking characteristics are readily obtained by survey. Often, survey data are available even before the access study is initiated. Sophisticated studies--those requiring data on urban traffic patterns and flows--are generally undertaken only in those urban areas for which the data have been collected and computerized for the purpose of more general urban transport analyses.

2.3 MODELS

In planning for airport access, models are generally used to assess the adequacy of existing or planned access facilities under projected demands. With the assistance of models, potential problems can be identified and effectiveness of alternative solutions can be assessed.

Models of airport access may be roughly categorized into one or more of the following four classes:

1. Traffic Flow,
2. Mode Split,
3. Equilibrium,
4. Airport Choice.

The "traffic flow" models are those which estimate the level of service associated with given roadway segments and volumes of

service associated with given roadway segments and volumes of flow along such segments. They may also calculate measures of delay in and unreliability of trip time associated with congestion of access facilities. Since vehicular traffic volumes are inputs to the model, it is implicitly assumed that model split, airport choices, and routing of traffic are independent of congestion. These are rather simplistic assumptions which make the traffic flow models of limited use unless combined with other models or unless characteristics of the access system make these assumptions valid. The TRB's Highway Capacity Manual is the primary example of the traffic flow model.

The "mode split" models are those which estimate the choice of access modes as a function of their service characteristics. They are used primarily for investigating the implication of upgrading an existing mode or introducing a new mode. They may also be used to investigate the impact of roadway congestion on choice of mode. Mode split models may be further characterized by the extent of disaggregation in the data by which they are developed and applied; the more disaggregate models are generally preferred. The number of existing mode split models is extremely large, and no single model enjoys any general acceptance.[1/]

The "general equilibrium" models are those which determine the routing of airport-related vehicles and all other vehicles as a function of the level of service experienced in given route segments. They are most useful when alternate routings exist or are planned for either the airport-related vehicles or for other vehicles competing for the same roadways. However, they are generally exceedingly expensive to implement since data must be obtained and coded for all transport links and (urban) trips. Once the data are obtained and coded, costs of running such models are relatively inexpensive. Consequently, they may often be used in

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1/ Ibid.

large urban areas where the data have been collected for regional transport planning. General equilibrium models assume constancy of origin/destination trip characteristics and thus may not be applicable in a multi-airport environment where airport choice is expected to be sensitive to the access system. The most accepted general equilibrium models are maintained by UMTA as part of its Urban Transportation Planning Systems Package (UTPS).

The "airport choice" models are those that estimate the passenger choice of airports as a function of the access system and the air transport system. The more sophisticated of these models explicitly determine characteristics of the air transport system as a function of the volume of passengers selecting each airport. Airport choice models may be used iteratively with mode split, general equilibrium, and traffic flow models to provide the ultimate in access planning in a multi-airport environment. However, preparation for their use may be exceedingly expensive because of the amount of data they require concerning the air transport system.

3. AIRPORT GROUND ACCESS PROGRAM FUNDING, IMPLEMENTATION, AND POLICY

3.1 FEDERAL FUNDING

Federal legislation exists to provide financial assistance for constructing access facilities: The Federal Aviation Administration (FAA Airport and Airways Development Act of 1970, amended 1976); Title 23 of U.S. Code (the FHWA legislation); and the Urban Mass Transportation Act of 1964, as amended.

1. FAA - Airport and Airways Development Act, Section 23(a) Public Law 94-353:

Provision for airport access improvements is described in Section 23(a) of Appendix B to the 1976 Amendment to the Airport and Airway Development Act of 1970; however, no specific funds are provided. Section 23(a) reads:

"DEMONSTRATION PROJECT

> Sec. 23(a) (1) (49 U.S.C. 1713 note) The Secretary of Transportation is authorized to undertake demonstration projects related to ground transportation services to airports which he determines will assist the improvement of the Nation's airport and airway system, and consistent regional airport system plans funded pursuant to section 13(b) of the Airport and Airway Development Act of 1970, by improving ground access to air carrier airport terminals. He may undertake such projects independently or by grant or contract (including working agreements with other Federal departments and agencies).
>
> (2) In determining projects to be undertaken under this subsection, the Secretary of Transportation shall give priority to those projects which (A) affect airport in areas with operating regional rapid transit systems with existing facilities within reasonable proximity to such airports, (B) include connection of the airport terminal facilities to such systems, (C) are consistent with and supportive of a regional airport system plan adopted by the planning agency for the region and submitted to the Secretary, and (D) will improve access for

"all persons residing or working within the region to air transport through the encouragement of an optimum balance of use of airports in the region."

2. Federal Highway Administration (FHWA) - Title 23 U.S. Code:

The FHWA administers several programs pursuant to Title 23 which currently or potentially provide funding for planning research and construction activities related to airport access. The 1973 Federal-Aid Highway Act also provides for Federal funding of preferential or exclusive bus and truck routes or lanes.

3. Urban Mass Transportation Administration (UMTA - UMT Act of 1964, as amended:

UMTA administers planning grant and capital facility programs relevant to airport access.

The Urban Mass Transportation Assistance Act of 1974 provides capital grants (Section 3) and funding for research, development and demonstration projects (Section 6).

3.2 IMPLEMENTATION

This section provides some examples and a discussion of Federal Funding of construction under the Urban Mass Transportation Act (1974), and under Federal Highway legislation.

1. UMTA

Philadelphia Pennsylvania

Under Section 3 of the Act, fifty-five million dollars were expended on the planning design and construction of a high speed rail line between the Philadelphia International Airport and the Central Business District.

Cleveland Ohio

The extension of the Cleveland rapid transit system to Cleveland Hopkins Airport is a second example of direct airport access grants by UMTA.

No UMTA funds appear to have been expended under Section 6 (technological demonstration grants) which could be related to Section 23 (a) of the Airport and Airway Development Act.

2. FHWA

Washington DC

Section 146 of the 1973 Highway Act provides for an express bus demonstration program at Dulles International Airport. Phase 1 of the study has been completed. Currently two buses are being procured, and express lanes on I-66 are being considered. The responsibility for this project now lies with UMTA.

San Francisco, California

Most airport access improvements have taken place within the framework of the interstate highway program and as a result of federal aid to "Urban" and "Primary" roads. Under the Interstate Highway Program, construction of coastal highway I-280 in the San Francisco Bay area provided a parallel route relieving the Bay Shore Freeway (I-80), and indirectly helped airport access. Of more specific airport-related interest is the construction of an east/west connector (I-380) which serves airport travelers directly. This project too was part of the Interstate Highway Construction Program.

3.3 FEDERAL POLICY

Section 23(a) of Public Law 94-353, the Airport and Airway Development Act Amendments of 1976 (See 3.1 above) provides authorization for undertaking projects related to demonstration projects for ground transportation services to airports. However, funding authority was not provided in Section 23 (a) since Congress concluded that other funding sources, namely the Urban Mass Transportation Act, were available to assist in developing ground transportation to airports.

As discussed above (See 3.1), two sections of the Urban Mass Transportation Act are relevant. One is Section 6 which provides for new technology, technique, or method demonstration grants,

and the other is Section 3 which provides for capital assistance grants for transit improvements.

Although Congress did not specifically name highway legislation as an alternate source for airport access funding, under the United States Code, Title 23, highway legislation is clearly the vehicle for funding airport ground access highway improvements.

With regard to on-airport ground access programs, the Airport and Airway Development Act authorizes Federal assistance under the Airport Development Aid Program (ADAP) for terminal, terminal transfer, recirculation, and access development (including multimodal development) which facilitates the movement of passengers and baggage in air commerce within the boundaries of the airport. This would appear to include people movers, portions of rail links, access roads, recirculation roads, etc. that are within the airport boundary.

Based on the legislative authority cited above and the pertinent legislative history underlying the enactment of Section 23 (a) of the 1976 Airport/Airway Act Amendments, the division of responsibility within the Department of Transportation for the funding of airport ground access projects is clearcut. Grants may be issued by FAA under ADAP for improved ground access, including roadways, rail lines and people movers, within the boundaries of the airport. There are several limitations on this authority, however. For example, such grants are not permissible from the Secretary's discretionary fund, cannot be made unless all safety and security equipment required for certification of the airport has been acquired, and must be matched on a 50-50 basis by local funding.

As noted above, projects for improved ground access to airports come within the purview of either the Urban Mass Transportation Administration or the Federal Highways Administration. Grants can, have, and will continue to be made by these administrations for high priority airport access projects. The determination of whether a given airport access project is appropriate for Federal

funding is largely a local matter, however. If the appropriate state and local planning agencies consider a particular airport ground-access project--of sufficient importance to include in their planning, within the amounts of Federal funds available to them through either UMTA or FHWA, and in conformance with appropriate statutory and administrative requirements for such funding--the Department will continue to provide funds through these administrations for deserving airport ground access projects.

4. FINDINGS

Based on the investigation and analysis to date the following has been determined:

1. There has been no comprehensive prior assessment of the extent to which inadequate ground access limits or constrains air travel nationwide.

2. Perceptions by airport officials as to whether or not ground access is a problem at airports is independent of the size of the airport.

3. Previous nationwide studies of airport ground access have concentrated in two areas:

   a. Quantitative analysis of airport access requirements; and
   b. The status of airport access plans within the metropolitan planning process.

4. Previous nationwide studies of airport ground access have failed to assess the economic impact of inadequate ground access.

5. National and regional planning structures are adequate for the consideration of airport ground access.

6. Data required for airport ground access planning exist for most airports, but their usefulness varies from site to site.

7. Models for analyzing airport access exist in various degrees of sophistication, the more sophisticated being kept and updated by regional transport planning agencies.

8. The DOT modal agencies have spent money, to improve airport ground access, and are continuing to do so.

9. Data needed for airport access planning should be collected more frequently and coordinated with the data acquisition and analysis systems of metropolitan transportation planning agencies.

10. Airport planning data should be made available to agencies that maintain regional transportation models and these agencies should, in turn, share data with airport officials.

5. ADDENDUM - FUTURE WORK

This study was initiated at the start of this fiscal year (FY-1978). The complexity of the problem requires that additional work be accomplished. The remaining effort will be necessary to portray an overall national picture of the airport access problem and attempt to offer possible solutions to that problem. The follow-on work will be presented in the form of an addendum to this report which will be submitted on or before September 30, 1978. The following sections offer a summary of the future addendum:

5.1 DEMAND/CAPACITY CASE STUDIES

Table 2 lists the airports which will be the subjects of case studies on airport ground access. Access capacity, airport capacity and demand will be estimated and compared (see Figure 1) in order to make a determination as to the adequacy of the access system. Economic implications of inadequate access will then be explored.

Airports were selected for inclusion in the case studies on the basis of the following criteria:

- o FAA regional recommendations,
- o Contacts with airport officials,
- o Magnitude of variety of problems,
- o Availability of data,
- o Geographical dispersion.

Appendix A synopsizes the access problems at the case study airports.

5.2 POTENTIAL ACCESS IMPROVEMENT PROJECTS

Solutions proposed for actual or projected airport access problems, which are identified in the airport Master Plans, will be evaluated. Common problems and their solutions will be selected from the case studies for consideration by local and state transportation planning bodies. Legislative and institutional alternatives designed to solve the problem directly or via improved planning and funding mechanisms will also be considered.

TABLE 2. CASE STUDY AIRPORTS

NO.	LOCATION	SIZE*	REGION	CODE	NAME
1.	New York NY	L	Eastern	LGA	LaGuardia
				JFK	John F. Kennedy Int'l
				EWR**	Newark Int'l
2.	Miami FL	L	Southern	MIA	Miami Int'l
				FLL	Ft. Lauderdale-Hollywood Int'l
3.	Los Angeles CA	L	Western	LAX	Los Angeles Int'l
4.	Boston MA	L	New England	BOS	Logan Int'l
5.	Denver CO	L	Rocky Mtn	DEN	Stapleton Int'l
6.	Chicago IL	L	Great Lakes	ORD	O'Hare Int'l
7.	Cleveland OH	L	Great Lakes	CLE	Cleveland-Hopkins Int'l
8.	Pittsburgh PA	L	Eastern	PIT	Greater Pittsburgh Int'l
9.	Reno NV	M	Western	RNO	Reno Int'l
10.	Louisville KY	M	Southern	SDF	Standiford Field
11.	Portland OR	M	Northwest	PDX	Portland Int'l
12.	Savannah GA	S	Southern	SAV	Savannah Municipal
13.	Baton Rouge LA	S	Southwest	BTR	Ryan Field
14.	Worcester MA	N	New England	ORH	Worcester Municipal

*Size: L = Large; M= Medium; S = Small; N = Non

**Newark is considered by the FAA to be a large hub separate from New York; however, it is to be considered part of the New York hub for this study.

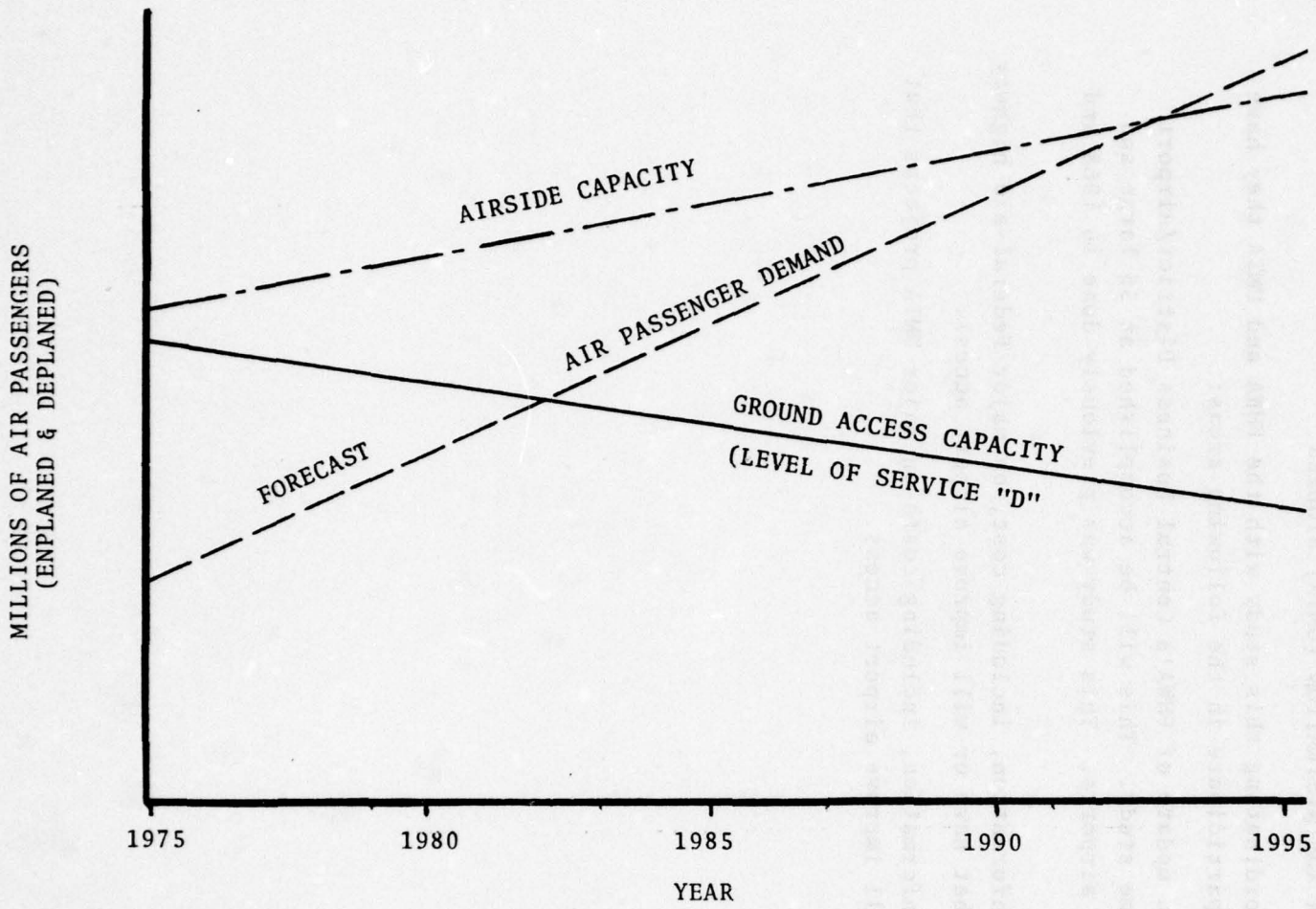

FIGURE 1. SAMPLE CAPACITY ANALYSIS CHART

5.3 FEDERAL HIGHWAY ADMINISTRATION (FHWA) AND URBAN MASS TRANSPORTATION ADMINISTRATION (UMTA) STUDIES

In coordinating this study with the FHWA and UMTA they have agreed to participate in the following areas:

1. An update of FHWA's Central Business District/Airport driving time study. This will be accomplished at 55 large and medium hub airports. This study was previously done in 1968 and 1972.

2. Information, including cost, on major Federal-aid highway projects that have or will improve airport access.

3. Information, including costs on major UMTA projects that have or will improve airport access.

APPENDIX

AIRPORT CASE STUDY SYNOPSES

LaGuardia Airport
New York New York

LaGuardia Airport is located in New York City on the East River, in the north section of the Borough of Queens, about eight miles from mid-Mahhattan. The airport is bounded on two sides by water; on the third by local streets; and on the fourth by the Grand Central Parkway, an east/west divided limited-access highway which provides the major access to the airport. There are also bridges over the highway to provide access to local roads in the Jackson Heights area of Queens.

Order of magnitude determinations indicate that the practical annual capacity of LaGuardia is 15.5 million passengers, constrained by the capacity of Grand Central Parkway and other approach roads. It is estimated that access demand will exceed access capacity by 1979, necessitating increased access delays and a shifting of travel to off-peak periods. Possibilities of relief include widening of the Grand Central Parkway at an estimated cost of $13 million, and the construction of an automated transport system to the Long Island Railroad and the IRT #7 Flushing line of the New York City subway system at an estimated cost of $86 million. Even with these improvements, however, access system capacity is expected to be reached by about 1990. Another alternative to be considered is the upgrading of access to Newark International Airport, which would relieve some of the pressure on LaGuardia.

John F. Kennedy International Airport
New York New York

The John F. Kennedy International Airport is located in New York City in the far southeast corner of Queens County. The multi-structure Central Terminal Area is bounded by runways on three sides with access being provided on the fourth side by an extension of the north/south Van Wyck Expressway. The Van Wyck Expressway connects with all major east/west highways running between eastern Long Island and Manhattan; its northern end runs into the Whitestone

Expressway which connects via Grand Central Parkway to LaGuardia Airport, and via the Whitestone Bridge to major routes throughout Westchester County and Connecticut. Just to the north of the airport boundary are the Nassau Expressway, and the Shore Parkway/ Southern State Parkway System, which help bleed some of the airport traffic from the Van Wyck Expressway.

The Tri-State Regional Planning Commission estimates that the access capacity at JFK International is about 23 million annual passengers, a figure that could be exceeded by 1978 demand. The Commission has proposed highway modifications costing $55 million that are expected to increase capacity by 9.5 million annual passengers. A high speed rail link between the airport and downtown Manhattan has been proposed but not implemented because of questions of cost and patronage. Revitilization of Newark is another alternative to the expansion of access capacity to JFK.

Newark International Airport
Newark New Jersey

Newark International Airport is located near Newark Bay, between U.S. Route 1 and the New Jersey Turnpike, partially in the City of Newark and partially in the City of Elizabeth. It is about 16 miles from mid-Manhatten. Access to New York City from the Turnpike is via the Staten Island Expressway (to Staten Island and Brooklyn), the Holland and Lincoln Tunnels (to Manhatten), and the George Washington Bridge (to upper Manhatten, the Bronx, and Westchester). Local and interstate highways provide access to New Jersey communities. A minibus "Air Link" service between Newark's main railroad station and the airport is in operation. The main railroad station also provides rail access to Manhattan via PATH (an interstate rapid rail transit system).

Newark is at a competitive disadvantage for passengers from Westchester County and Connecticut, which generate a significant percentage of the travel from the New York region. In addition, taxi fares between Manhattan and Newark Airport are relatively high because taxis, not being able to pick up a return fare, charge

for a two-way trip. Finally, it appears there is a psychological barrier which keeps New Yorkers from crossing the state line to New Jersey. This barrier is reinforced by the limited airservices out of Newark, a situation which is characteristic for a number of airports in multi-airport hubs.

Numerous access improvements have been proposed over the past several years including:

- o Improved taxi/bus/limousine service to Manahattan and bus connections to interstate rail service in Newark.
- o The opening of Interchange 13A on the New Jersey Turnpike, which will connect the Turnpike with U.S. Route 1 at the southern edge of the airport.
- o Extension of an automated passenger distribution system from the Airport to a rail station at McGlellan Street.
- o A new highway connector between the airport and Interstate 78 to serve the proposed Interstate 78/New Jersey Route 21 Freeway interchange.

Miami International Airport
Miami Florida

Miami International Airport is located west of the CBD not far from several major arteries. Running east/west are the Airport Expressway which terminates at LeJeune Road, just north-east of the airport, and the East-West Expressway which runs south of the Airport. Both expressways run through downtown Miami and into Miami Beach, which is east of the CBD. Both also connect to major north/south arteries. Entry to the airport is via LeJeune Road, a major commercial, signaled boulevard which runs north/south between the Airport Expressway and the East-West Expressway.

LeJeune Road is heavily traveled and quite often congested, particularly at its intersection with N.W. 36th Street. This intersection is reportedly one of the busiest in the state. With enplanements forecasted to grow from 4.7 million in 1975 to 15.0 million by 1990, improvements in the access system will be necessary. The most likely of these is the upgrading of LeJeune to a

limited access facility between the Airport Expressway and East-West Expressway.

Current construction of a rapid transit system will eventually result in some relief of north/south highway lanes and, in addition, create the potential of an airport rail link.

Fort Lauderdale-Hollywood International Airport
Fort Lauderdale Florida

The Fort Lauderdale-Hollywood International Airport is located in Broward County, Florida just south of Fort Lauderdale and north of Hollywood, both popular winter vacation resorts. It also serves the Miami Beach and North Miami Beach residential and resort areas just south of Hollywood. The airport is located between two north/south highways. To its west is I-95, a limited-access divided highway; to its east is US1/A1A a signaled highway with heavy commercial activity. About 2 miles west of I-95 is another north/south limited-access divided highway, the Florida Turnpike. Currently, the terminal building is located on the east side of the airport, with access only to US1/A1A. There exists an at-grade railroad crossing on the terminal entrance roadway and a traffic light at its intersection with US1/A1A.

The active Master Plan for the airport projects a significant capacity shortage on US1/A1A by the year 1985 in spite of significant planned improvements. In addition, the traffic lights at the intersection of US1/A1A and the airport road further reduce capacity. Current plans call for the relocation of the terminal building to the west of the airport with direct access to I-95 in the near future and direct access to the Florida Turnpike as well in the more distant future. However, there is currently heavy traffic on all of the north/south routes and projections anticipate further growth. Transportation systems plans call for a doubling of north/south lanes by 2000, however, the environmental problems make such a development doubtful.

Los Angeles International Airport
Los Angeles California

Los Angeles International Airport is located just off the Pacific Ocean at the extreme west of the Los Angeles basin. The primary access artery is the San Diego Freeway (I-405) which runs north/south, west of the city but east of the airport. There is no direct access between the freeway and the airport. Traffic must use commercial surface streets, primarily Century Boulevard, which runs east/west, and Sepulveda Boulevard, which runs north/south. Ground access capacity is estimated at 40 million annual enplanements assuming the construction of a new system of freeways which were to provide supplemental access to the airport from the west, north, and south. Two of these freeways have been deleted from the state's plan for freeway construction and environmental and economic concerns make future consideration for construction unlikely. It is currently projected that by 1990, all north/south roadways will operate at 50 percent over design capacity, and quite close to absolute capacity over an extended peak period.

Master plan studies call for the construction of satellite terminals at various strategic points in the Los Angeles area where passengers could park.

Logan International Airport
Boston Massachusetts

Logan International Airport is located east of the CBD and separated from it by Boston Harbor. Traffic from the North Shore (north-east of the city) can reach the airport by auto and truck without crossing the harbor; however, the bulk of the airport traffic (80%), plus all traffic between the North Shore and the CBD, must cross the harbor using one of two facilities--the Summer/Callahan Tunnel or the Mystic/Tobin Bridge. These facilities have a combined daily capacity of 165,000 vehicles. The most recent draft Master Plan for Logan predicts that this capacity limit will be reached sometime between 1980 and 1985, with airport traffic contributing about 35% of the total. Compounding this problem is

the fact that access to the airport via the bridge is significantly longer in both time and distance for most airport trips than is access via the tunnel. In addition, to reach the tunnel or bridge, most access trips must pass through the CBD along a major arterial highway which is severely congested in peak periods. Finally, because of environmental concerns, it is unlikely that a third harbor crossing will be built in the near future.

In order for Logan Airport to accommodate forecasted demand, better use will have to be made of existing facilities. Logan is fortunate to be one of the few airports in the country within easy access of a rapid rail transit system. The rail station is on the periphery of the airport and is connected by frequent bus service to all passenger terminals and other airport traffic generating points.

Stapleton International Airport
Denver Colorado

Stapleton International Airport is located within the limits of the City and County of Denver about six miles east of the CBD. The principal access route from the CBD is 32nd Avenue, a six-lane signaled artery. Quebec Street, a four-lane commercial, signaled road and the major north/south artery serving the airport, intersects I-70 about one mile north of the airport. I-70 provided connections to all major north/south arteries. The main entrance to the airport is at the intersection of 32nd Avenue and Quebec Street. Another entrance is through Syracuse Street, which runs north/south just east of Quebec Street and intersects the airport circulation road on airport grounds. The major bottleneck to access is the intersection at 32nd and Quebec. Possible improvements include the construction of an interchange at 32nd and Quebec, and the upgrading of Quebec to a limited access facility.

O'Hare International Airport
Chicago Illinois

The O'Hare International Airport is the busiest airport in the world. It is located 17.5 miles from the CBD, and the off-peak average travel time is 27 minutes. During peak travel periods, the airport access time nearly doubles, and the average travel speed to and from the airport is approximately 24 mph. A six-lane controlled access highway provides access into the airport, and the 50,000 Annual Average Daily Traffic (AADT) volume on this road is below the roadway capacity. The greatest delays are encountered on I-94, an eight-lane expressway with two reversible lanes, where AADT volume is in excess of 160,000. Approximately 30% of all trips are destined for the CBD.

A proposed rapid transit extension to O'Hare has been considered for over 10 years. Currently, the rapid transit line terminates at Jefferson Park, 9.6 miles from the CBD. Studies have been done on an extension of this line for the remaining eight miles. It has been projected that an extension of the rapid transit line would serve nearly 25,000 daily air passengers, employees and visitors, assuming a 30 million annual passenger enplanement level.

Chicago Midway Airport, once the world's busiest, is handling only 4% of the region's users, and has the capacity to handle a 10 million annual passenger volume. Diverting many of Chicago's short-haul, origin-destination passengers to Midway could alleviate groundside congestion at O'Hare, but would transfer the ground access problem to Midway, unless improvements were made. The airlines have consistently opposed transferring operations to Midway.

Cleveland-Hopkins International Airport
Cleveland Ohio

The Cleveland-Hopkins International Airport is located 13 miles from the CBD and is served by a rapid rail transit system. The rapid transit line opened in 1968, and served nearly 700,000 passengers during its first full year of operation. Since 1969,

the annual ridership has been declining. About 8% of the total airport trips are made on rapid transit.

Interstate 71 is the primary ground access link to the airport. The connection from I-71 to the airport is via an arterial highway.

The State of Ohio DOT is currently developing plans for improvements to SR237 and CR87 involving grade separated interchanges at the airport ingress and egress roads. When completed, the groundside access capacity at the airport will be for nearly 10,000 vehicles per hour.

The Ohio DOT's current highway construction program calls for initiating construction of a portion of I-480 Outer Belt Freeway during the 1978 calendar year. A portion of this facility parallels the northern boundary of the airport. The available roadway capacity of I-71 and I-480 should exceed airport passenger demand into the late 1990's. However, there will still be local problems if improvements in the vicinity of the airport are not made.

Greater Pittsburgh International Airport
Pittsburgh Pennsylvania

Greater Pittsburgh International Airport (GPIA), located 16 miles west of the city, has an annual enplanement of about 4 million passengers with a transfer rate of 30%. Some 4,000 people are employed at GPIA.

The two major access highways are the Beaver Valley Expressway and the Airport Parkway (PS. Route 60). The Beaver Valley Expressway is a four-lane limited access freeway providing access from the west. The Airport Parkway is a four-lane divided highway providing access from the east, from which 80% of the access traffic originates.

Plans for relocating the airport terminal were dropped and a new Master Plan Study is now underway. This was done, in part, because actual airport growth has been less than anticipated in the former Master Plan. The number of enplanements forecast for

1975 (4.35 million) were not met until 1978. However, even with the less than anticipated growth, access capacity problems are still a possibility. Demand is now being met along the two major approaches. However, peak hour volumes do cause slowdowns near the CBD, as the airport roads are operating at or near capacity. If the new Master Plan calls for a new terminal, present facilities would be inadequate to meet the demand.

In 1974, SRPG, the Regional Transportation Agency, adopted a long range highway and transit plan for southwestern Pennsylvania. Among the findings were plans for extending the Beaver Valley Expressway to the Airport Parkway and the upgrading of the Airport Parkway to freeway standards. Furthermore, an Airport Terminal Freeway was called for, travelling north from Route 22/30, past the proposed terminal, to the new Beaver Valley Expressway.

Since that time, the Airport Terminal Freeway and the upgrading of the Airport Parkway were dropped from subsequent long-range plans (1990-2000), while plans for the Beaver Valley Expressway remained. However, the long-range plans themselves have been dropped for the time being due to a re-evaluation of state highway needs. Long-range plans for an exclusive busway from the airport to the Pittsburgh CBD were also discontinued. In summary, there are no current plans for improving external access to the airport although congestion may become a problem in the future.

Reno International Airport
Reno Nevada

Reno International Airport serves the Reno/Sparks resort area in Nevada. The airport is located south of the Reno/Sparks corridor, to the east of Reno and west of Sparks. The major access to the airport from downtown Reno are south on Virginia Street, and west on Plumb Lane or south on Virginia Street, west on Mill Street, and south again on Terminal Way. All access roads are four lane commercial roads currently operating at or near capacity.

To compound this problem, eight new casinos are scheduled to open by July 1978 (to add to the existing 17 in the Reno/Sparks

area) including the MGM Grand Reno, which is being billed as the worlds largest casino. Several more casinos are scheduled to open by 1980, and it is likely that Disney will open an Independence Lake year-round resort by 1981. American, Braniff, Continental, Delta, Texas International, and TWA airlines have filed applications to serve Reno from Southwest and eastern cities. PSA has applied for no-frill service routes from California to Reno; and United Airlines has announced plans to offer a low-fare, high-frequency "shuttle" service, subject to CAB approval, between Reno and three cities--San Francisco, Los Angeles and Oakland. These new developments have made the airport's 1976 Master Plan seriously out of date--1990 projections are now expected to occur by 1980. On-airport development has been accelerated, as have off-airport plans, but projected completion dates fall well after the anticipated crunch. Inadequacy of ground access is assumed, and it remains to be seen how this will affect the development of the area or whether operational means (such as shuttle buses) can be used to overcome foreseen problems.

Standiford Field
Louisville Kentucky

Standiford Field is located approximately five miles south of Louisville's CBD. The terminal access road exits directly from I-264 (the Watterson Expressway), which loops the city and runs east/west at the airport entrance. The airport interchange is less than a mile from the interchange of I-264 with I-65 (Kentucky Turnpike) which runs north/south and through the CBD. The proximity of these interchanges as well as congestion on I-264 are the causes of the major access problem at Louisville. This problem is compounded by nearby major intersections just east and just west of the two cited--this results in four intersections within a one and one-half mile stretch. Possible solutions include the widening of I-264 (airport plans estimate the entire existing expressway between the airport and I-65 would be required by 1995 just to handle airport traffic), and the relocation of the terminal

building to the south of the airport with access directly onto I-65 about two miles south of its intersection with I-264.

Portland International Airport
Portland Oregon

Portland International Airport is situated approximately eight miles to the northeast of the Portland CBD. The airport handles about 3.5 million annual departing and arriving passengers.

Access to the airport proceeds mainly along 82nd Avenue north from the Banfield Freeway and east-west along Marine Drive principally to I-5 to the west. Other available east-west routes (Columbia Boulevard) are used to a lesser extent.

Projections call for a doubling of vehicular traffic after taking onto account the increase in usage of public transportation from the current utilization of 6% to 14% by the year 2000.

I-205 scheduled for completion by the early 1980's will provide at least four more north-south access lanes via Marine Drive, west to the airport. Improvements are also planned in the public bus services (DART and TRIMET).

Main delays are experienced due to congestion of 82nd Avenue and other access roads due to local rush-hour traffic.

Airport master planning and land use studies are now in progress. An access-egress study by Peat, Marwick, Mitchell & Co. was completed in 1977. It concentrated on parking statistics and included traffic counts and origin and destination studies.

Savannah Municipal Airport
Savannah Georgia

The Master Plan for Savannah Municipal Airport calls for the eventual relocation of the terminal building to the northwest quadrant of the airport to meet forecasted demand. Also planned is a runway to the north of the proposed terminal building, making the planned access to I-95 just west of the airport the only

feasible access route for handling the projected volumes of traffic. The problem is that the Georgia Department of Transportation takes a position that they will not reserve or build an interchange or access road unless there is an established business or residential area in existence. Consequently, the airport's plans had been threatened when a major industry owning all the property north of the airport made its own plans to build an interchange just north of the airport proposed boundary, an interchange which, if built, would negate the possibility of an airport interchange. With the FAA's assistance, the Savannah Airport Commission succeeded in convincing the Bureau of Public Roads to move other planned interchanges north or south in order to preserve the possibility of an airport interchange. At the current time, this informal arrangement has been satisfactory as no further indication has been made by any company concerning a new interchange. The issues to be addressed in this case study are jurisdictional problems which may affect airport access systems consequently constraining air travel and airport capacity, and alternative means of alleviating such problems.

Ryan Field
Baton Rouge Louisiana

Ryan Field is located approximately seven miles north of downtown Baton Rouge. Orginally constructed and used as a military airfield during World War II, Ryan Field presently provides air carrier and commuter airline services for the Baton Rouge area, and recorded 152,000 air carrier passenger enplanements in 1974.

Until recently, direct off-airport access to Ryan Field was somewhat restricted. It was necessary to change major thoroughfares at least once between the central business district or other major origins, and the entrance to Ryan Field at Airbase Avenue. Access routes via Scenic Highway, Plank Road, and Harding Boulevard are through congested commercial and industrial areas with high levels of cross-traffic. In addition, the deteriorated condition of many of these commercial and industrial areas did not provide a good impression on visitors to the area.

Completion of Interstate Highway 110 to Harding Boulevard and the entrance to Ryan Field has significantly improved accessibility between the airport entrance at Airbase Avenue and Harding Boulevard, and other areas in the Baton Rouge area. Essentially, Interstate Highway 110 allows nonstop, direct access to the airport from many areas of the Parish and beyond via connections with Interstate Highways 10 and 12. Access time between the Central Business District and Ryan Field is now ten minutes via I-110. However, access from the airport boundary to the terminal via Airbase Avenue is still a problem. Deficiencies along the route include poor separation of terminal and industrial traffic, substandard horizontal alignment, and aesthetically unattractive properties.

Worcester Municipal Airport
Worcester Massachusetts

Worcester Municipal Airport is a non-hub airport providing scheduled air carrier sevice for about 50,000 annual passengers (25,000 enplaned).

The airport is of interest as a potential reliever airport for Boston's Logan Airport, more specifically, for air cargo due to the airport being located on a plateau above the city far from settled locations and consequently relatively free of noise problems.

Access to Worcester is very difficult and involves a 2-lane state road (122) connecting the access road to the nearest interstate highway, I-290, and the Mass Turnpike, I-90. Traffic counts show that this road and its intersections are completely saturated. Speed runs confirm that the last 5 miles require 15 minutes to travel normally and 30 minutes during rush hour.

The utilization of Worcester for a significant fraction of Logan's passenger load or for freight is, at present, severely limited by the access problem.

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